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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/804,891	03/13/2001	Eit Drent	TS0982 (US)	1353

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07/30/2002

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EXAMINER

ZUCKER, PAUL A

ART UNIT

PAPER NUMBER

1621

DATE MAILED: 07/30/2002

15

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Applicati n No.

09/804,891

Applicant(s)

DRENT ET AL.

Examin r

Paul A. Zucker

Art Unit

1621

-- The MAILING DATE of this c mmunication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 5/14/2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 10.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Current Status*

1. This action is responsive to Applicant's amendment of 14 May 2002 in Paper No 20.
2. Receipt and entry of Applicant's amendment is acknowledged.
3. The objections to the specification set forth in paragraph 1 of the previous Office Action in Paper No 18 is withdrawn in response to Applicant's amendment.
4. The rejections under 35 USC § 112, second paragraph, set forth in paragraphs 3 and 4 of the previous Office Action in Paper No 9 are withdrawn in response to Applicant's amendment.
5. Claims 1-23 remain outstanding.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
  2. Ascertaining the differences between the prior art and the claims at issue.
  3. Resolving the level of ordinary skill in the pertinent art.
  4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
6. Claims 1-13 are finally rejected under 35 U.S.C. 103(a) as being unpatentable over Sielkin (US 5,679,831 10-1997 and further in view of Drent et al (EP 0495548-A2 10-1992).

Instantly claimed is a process for the hydrocarbonylation of pentenenitrile in the presence of palladium and a phosphine ligand to produce 5-cyanovaleric acid.

Sielkin teaches (Column 1, lines 53-62) the preparation of terminal esters by the carbonylation of an internally saturated olefin in the presence of an alcohol, carbon monoxide, palladium, and a bidentate organic phosphorous, arsenic or antimony ligand at a pH of less than two (measured at 18°C in aqueous solution). Sielkin teaches (Column 4, line 48) the use of this process on 2- and 3-pentenenitrile.

Sielkin further teaches (Column 4, line 48) preferred ligand –palladium ratios of 1:1-5:1 corresponding to the instant claimed range, at temperatures (Column 4, lines 26-27) between 50 °C and 200 °C which encompass the instant preferred 80°C-125 °C.

Sielkin is silent with regard to the use of the simple hydrocarbon linked bidentate ligand. Sielkin prefers a ferrocene linked ligand.

Drent, however, teaches (Table II, Pages 10-11, in particular, 2-cyanoethene, page 10, entry XIII) the use of 1,3-(di-tert-butyl phosphino)-propane for use in the carbonylation of olefins. Drent further teaches (Page 3, lines 39-42) that the olefin can be an internal olefin as well. Drent teaches carbonylation conditions that encompass the instant conditions as well, teaching preferred temperatures (Page 4, lines 3-4) between 75 °C and 150 °C, a palladium catalyst (Page 3, lines 7-10) and ligand-catalyst ratios (Page 3, lines 25-26) of 1:1-5-:1.

Thus the instantly claimed process would have been obvious to one of ordinary skill in the art. The motivation would be to employ a less complex and expensive catalyst in the process of Sielkin to improve the overall profitability of the process for the synthesis of  $\epsilon$ -caprolactam, an important polymer feedstock. The expectation for success would be high since all elements of the process are taught.

***Response to Applicant's Arguments with Regard to This Rejection***

7. Applicant has made several arguments which the Examiner summarizes and responds to below:

- a. Applicant argues (Amendment, page 2, lines 9-16) that applicant was unable to reproduce the results of US' 831 under the conditions described therein notwithstanding the fact that this reaction is taught (US' 831, column 4, lines 40-48) for the production of the linear ester from 2- or 3- pentene nitrile. To this the Examiner responds that such a finding would provide motivation for someone of ordinary skill in the art to explore other ligands which might be successful in the case of 2- or 3-pentene nitrile. Ligands such as that taught in EP' 548 for use in the carbonylation of unsaturated nitriles under essentially identical conditions to those of the instantly claimed process.
- b. Applicant further argues that EP' 548 teaches that the branched ester-nitrile is formed rather than the linear compound as is currently claimed. To this the Examiner responds the conditions of EP' 548 are essentially identical conditions to those of the instantly claimed process with the only difference corresponding to the choice of starting material with pentenenitrile

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in the instant case replacing the acrylonitrile of EP' 548. Suggestion for such substitution can be found in EP' 548 which in fact subjects pentenenitrile to conditions that correspond to those instantly claimed except for the identity of the ligand.

- c. Applicant argues that the motivation for producing a lower cost process does not render an invention obvious without some teaching or suggestion for their combination within the references. The Examiner points out, in response, that the applied references describe essentially identical processes and both teach the application of their respective processes to unsaturated nitrile starting materials. The combination of the teachings of these references would therefore clearly be obvious to one of ordinary skill in the art and the expectation for the success of such a combination would therefore be very high.

Applicant's arguments filed 14 May 2002 have been fully considered but they are not persuasive for the reasons indicated above.

8. Claims 14-23 are finally rejected under 35 U.S.C. 103(a) as being unpatentable over Sielkin (US 5,679,831 10-1997 and further in view of Drent et al (EP 0495548-A2 10-1992) and further in view of Di Cosimo et al (US 6,077,955 06-2000).

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Instantly claimed is a process for the hydrocarbonylation of pentenenitrile in the presence of palladium and a phosphine ligand to produce 5-cyanovaleric acid and its further conversion to caprolactam.

Sielkin teaches (Column 1, lines 53-62) the preparation of terminal esters by the carbonylation of an internally saturated olefin in the presence of an alcohol, carbon monoxide, palladium, and a bidentate organic phosphorous, arsenic or antimony ligand at a pH of less than two (measured at 18°C in aqueous solution). Sielkin teaches (Column 4, line 48) the use of this process on 2- and 3-pentenenitrile.

Sielkin further teaches (Column 4, line 48) preferred ligand –palladium ratios of 1:1-5:1 corresponding to the instant claimed range at temperatures (Column 4, lines 26-27) between 50°C and 200°C which encompass the instant preferred 80°C-125°C. Finally, Sielkin teaches (Column 7, lines 11-12) that byproducts of the carbonylation products are branched (see instant Claim 15).

Sielkin is silent with regard to the use of the simple hydrocarbon linked bidentate ligand preferring a ferrocene linked ligand.

Drent, however, teaches (Table II, Pages 10-11, in particular, 2-cyanoethene, page 10, entry XIII) the use of 1,3-(di-tert-butyl phosphino)-propane for use in the carbonylation of olefins. Drent teaches (Page 3, lines 39-42) that the olefin can be an internal olefin as well. Drent teaches carbonylation condition that encompass the instant conditions as well, teaching preferred temperatures (Page 4, lines 3-4)

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between 75 °C and 150 °C ,a palladium catalyst (Page 3, lines 7-10) and ligand-catalyst ratios (Page 3, lines 25-26) of 1:1-5-:1.

Sielkin and Drent are both silent with regard to the subsequent conversion of pentenenitrile into  $\epsilon$ -caprolactam.

Di Cosimo, however, teaches (Column 18, line 61- column 19, line 18) the reduction via catalytic hydrogenation of  $\omega$ -cyanocarboxylic acids to the corresponding  $\omega$ -aminocarboxylic acids and their subsequent cyclization to the lactams. In particular, Di Cosimo teaches (Example 37, Column 35, line 16 –column 36, line 10) the catalytic hydrogenation of 5-cyanopentanoic acid and cyclization of the resultant 5-aminopentanoic acid salt.

Thus the instantly claimed process would have been obvious to one of ordinary skill in the art. The motivation would be to employ a less complex expensive catalyst in the process of Sielkin to improve the overall profitability of the process for the synthesis of  $\epsilon$ -caprolactam, an important polymer feedstock. The incorporation of a known process for the synthesis of the ultimate target would likewise be obvious since this is the ultimate intended use for the 5-cyanopentanoic acid. The expectation for success would be high since all elements of the process are taught.

***Response to Applicant's Arguments with Regard to This Rejection***

9. Applicant refers to his arguments with regard to the previous rejection under 35 U.S.C. 103(a) discussed above and adds no additional arguments. The Examiner therefore refers Applicant to the Examiner's response above.



***Conclusion***

10. Claims 1-23 are outstanding. Claims 1-23 are finally rejected.

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul A. Zucker whose telephone number is 703-306-0512. The examiner can normally be reached on Monday-Friday 7:00-3:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Johann R. Richter can be reached on 703-308-4532. The fax phone numbers for the organization where this application or proceeding is assigned are

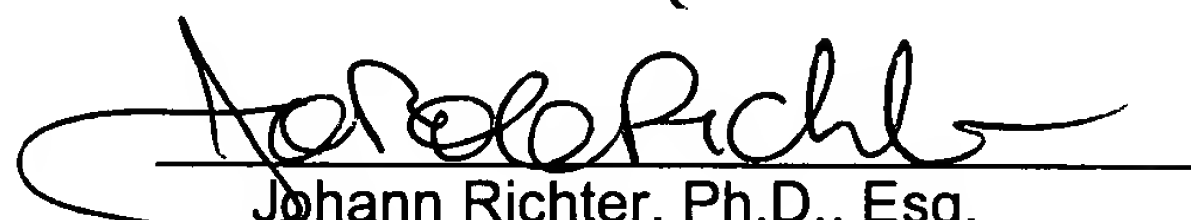
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703-308-4556 for regular communications and 703-308-4556 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1235.

Paul A. Zucker  
Patent Examiner  
Technology Center 1600

July 20, 2002



Johann Richter, Ph.D., Esq.  
Supervisory Patent Examiner  
Technology Center 1600